

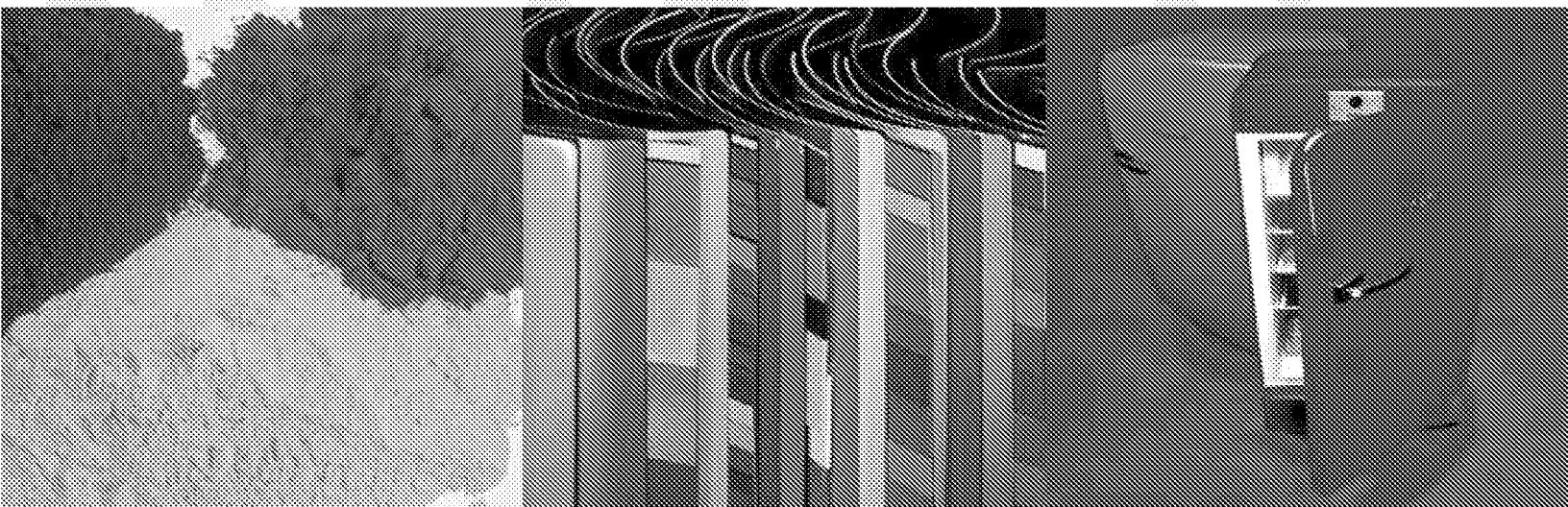
Ciba Specialty Chemicals

Ciba



Product Selection Guide

for Powder Coatings



Coating Effects

Value beyond chemistry

Ciba® CHIMASSORB®
Ciba® CINQUASIA®
Ciba® CROMOPHTAL®
Ciba® DAROCUR®
Ciba® DISPEX®
Ciba® GLASCOL®
Ciba® GRAPHITAN®
Ciba® EFKA®
Ciba® FILAMID®
Ciba® FILESTER®

Ciba® FILOFIN®
Ciba® HORNA®
Ciba® HORNACHROME®
Ciba® HORNATHERM
Ciba® IRGACOLOR®
Ciba® IRGACURE®
Ciba® IRGAFOS®
Ciba® IRGAGUARD®
Ciba® IRGALITE®
Ciba® IRGANOX®

Ciba® IRGAPHOR®
Ciba® IRGAPLASTOL®
Ciba® IRGAROL®
Ciba® IRGASPERSE®
Ciba® IRGAZIN®
Ciba® LIGNOSTAB®
Ciba® MICRANYL®
Ciba® MICROLEN®
Ciba® MICROLITH®
Ciba® MICROSON®

Ciba® ORACET®
Ciba® ORASOL®
Ciba® RHEOVIS®
Ciba® TINOPAL®
Ciba® TINUVIN®
Ciba® UNISPERSE®
Ciba® UVITEX®
Ciba® VISCALEX®

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Introduction

This booklet provides a comprehensive list of the pigments and additives in the Ciba Specialty Chemicals ranges for powder coatings.

The products are divided into five main categories: pigments, light stabilizers, antioxidants, optical brighteners, photoinitiators.

The pigment classes are subdivided into organic and inorganic pigments, chrome yellow and molybdate orange pigments, pigment preparations.

Suitable fields of application are indicated next to each product, but it must be stressed that these are only intended as a general guide.

Products, processes and services from Ciba Specialty Chemicals enable you to create effects that add performance, protection, color and strength to your coatings.

For more detailed information on specific applications and product control please consult our marketing departments or local sales organizations.

Further technical product information and details on use in food packaging materials, toys and other consumer goods (EHS data) are available on our Internet site at:

 www.cibasc.com

 [Product Search](#)

Let us help you create effects that improve the quality of life!

Key to Symbols and Application Suitability

- ® Registered trademark
- Recommended
- Other potential uses



ETAD Ciba Specialty Chemicals is a member of:
Ecological and Toxicological Association of Dyes and Organic Pigments Manufacturers

Pigments

Organic and Inorganic Powder Pigments

Ciba® IRGAZIN®, Ciba® CROMOPHTAL® and Ciba® CINQUASIA® products are high-performance organic and inorganic pigments that combine very good tinctorial properties with excellent fastness to light, weather, chemicals and solvents. They fulfill the requirements of the most critical applications.

The Ciba® IRGALITE® range consists of classical organic pigments. Ciba® IRGACOLOR® pigments are inorganic pigments with outstanding resistance to heat, weather and chemicals.

Product name	Chemical type CI No	CI Generic name	Applications			Density (g/cm ³)	Surface area (m ² /g)	Heat stability (°C) Overprint resistance	Acid-fastness/ Alkali-fastness	Fastness PES/TGIC		Opacity (med = medium)	Color strength (1:25 ISD) PES/TGIC (part 100, for 1 part pigment)
			Architectural	General industry	Appliance					Full shade	1/25 ISD		
IRGAZIN® Yellow 2093	Bismuth vanadate 771740	Pigment Yellow 184	●	●	●	5.9	9.6	220 5	4-5 5	4-5	4-5	high	1:19
IRGAZIN® Yellow 2094	Bismuth vanadate 771740	Pigment Yellow 184	●	●	●	6.1	9.1	220 5	4-5 5	4-5	4-5	high	1:21
CROMOPHTAL® Yellow 8GN	Azo condensation 20037	Pigment Yellow 128	●	●	○	1.5	85	200 5	5			low	1:49
IRGAZIN® Yellow 3RLTN	Tetrachloroisocoumarinone 56280	Pigment Yellow 110	●	●	●	1.8	27	220 5	5	4-5	4-5	med	1:60
IRGALITE® Orange MOR	Dianisidine Orange 21160	Pigment Orange 16		○	●	1.4	22	200 4-5				high	1:82
IRGAZIN® DPP Scarlet EK	Diketo-pyrrolo-pyrrole Pigment Red 253		●	●		1.4	19	200 5	5	4	4	high	1:54
IRGALITE® Red CLO	Lake Red C (Ba) 15585:1	Pigment Red 53:1		○	●	1.8	51	200 4-5				low	1:87
IRGAZIN® Red 2029	Diketo-pyrrolo-pyrrole/Azo		●	●		1.6	18	220 5	4-5 5	4	4	med	1:80
IRGAZIN® Red 2030	Diketo-pyrrolo-pyrrole 56110	Pigment Red 254	●	●		1.6	27	220 5	5	4-5	4	med	1:111
IRGAZIN® Red 2031	Diketo-pyrrolo-pyrrole		○	●		1.4	25	200 5	5	3-4	4	high	1:123
IRGAZIN® DPP Red BO	Diketo-pyrrolo-pyrrole 56110	Pigment Red 254	●	●		1.6	14	220 5	5	4-5	4	high	1:77
IRGAZIN® DPP Red Ultra Opaque	Diketo-pyrrolo-pyrrole Pigment Red 264		●	●			32	200 4-5	5	4	4	high	1:103
CINQUASIA® Red Y RT-759-D	Quinacridone 73900	Pigment Violet 19	●	●	●	1.5	20	220 5	5	4-5	4-5	med	1:50
IRGAZIN® Red A2BN	Anthraquinone 63300	Pigment Red 177	●	●	○	1.5	62	220 5	5	4-5	4-5	med	1:87
IRGAZIN® Magenta 2012	Quinacridone Pigment Red 282		●	●	●	1.4	60	220 5	5	4-5	4-5	med	1:87
CINQUASIA® Violet R NRT-201-D	Quinacridone 73900	Pigment Violet 19	●	●	●	1.5	64	220 5	5	4-5	4-5	high	1:67
CROMOPHTAL® Violet GT	Dioxazine 51319	Pigment Violet 23	●	●	●	1.5	58	220 5	5	4-5	4	low	1:225
IRGAZIN® Blue A3RN	Indanthrone 69800	Pigment Blue 60	●	●	●	1.5	53	220 5	5	4-5	4-5	low	1:61
IRGALITE® Blue BSP	Cu-Phthalocyanine (α) 74160	Pigment Blue 15:1	●	●	●	1.6	64	220 5	5	4-5	4-5	high	1:133
IRGALITE® Blue 2234	Cu-Phthalocyanine (α non-flocc) 74160	Pigment Blue 15:2	●	●	●	1.9	58	220 5	5	4-5	4-5	high	1:130
IRGALITE® Blue PG	Cu-Phthalocyanine (β) 74160	Pigment Blue 15:3	●	●	●	1.6	57	220 5	5	4-5	4	med	1:159
IRGALITE® Green GLN	Cu-Phthalocyanine (halogenated) 74260	Pigment Green 7	●	●	●	2.2	41	200 5	5	4	4	med	1:71

Product name	Chemical type CI No	CI Generic name	Applications			Density (g/cm ³)	Surface area (m ² /g)	Description
			Architectural	General industry	Appliance			
IRGACOLOR® Yellow 3GLM	Bismuth vanadate 771740	Pigment Yellow 184	●	●	●	5.6	11	a greenish yellow bismuth vanadate pigment with excellent weather fastness, high saturation
IRGACOLOR® Yellow 3RLM	Bismuth vanadate		●	●	●	5.3		reddish bismuth vanadate
IRGACOLOR® Yellow 5RLM	Bismuth vanadate		●	●	●	4.9	12	reddish bismuth vanadate
IRGACOLOR® Yellow 14247	Bismuth vanadate		●	●	●	3.8	7.8	a yellow bismuth vanadate pigment with good weather resistance
IRGALITE® Yellow BRM	Diarylide o-Toluidide 21095	Pigment Yellow 14		○	○	1.4	33	semi transparent classical yellow
IRGALITE® Yellow BAWP	Diarylide m-Xylylide Pigment Yellow 13			○	○	1.3	11	semi transparent classical yellow
IRGAZIN® Yellow 2GLTE	Isoindolinone 56284	Pigment Yellow 109	●	●	○	1.9	30	very pure greenish yellow with good allround properties
IRGAZIN® Yellow 2RLT	Tetrachloroisooindolinone 56280	Pigment Yellow 110	●	●	●	1.8	49	transparent reddish yellow pigment
CROMOPHTAL® Orange 2G	Tetrachloroisooindolinone 11265	Pigment Orange 61	●	●	●	1.7	53	orange with good weather resistance
IRGAZIN® Orange 2037	Diketo-pyrrolo-pyrrole/isoindoline		○	○		1.6	18	high saturated opaque orange pigment
IRGALITE® Red LCB	Lake Red C (Ba) Pigment Red 53:1		○	●				classical red for deep shade applications
IRGALITE® Red FBL	Azo 2B-toner (Mn) 13865:4	Pigment Red 48:4	○	●	1.6	54		classical bluish red for deep shade applications
IRGALITE® Red 2BY	Azo 2B-toner (Sr) Pigment Red 48:3		○	●	1.8	36		classical red
IRGALITE® Red 2BSP	Azo 2B-toner (Sr) Pigment Red 48:3		○	●	1.8	36		classical red
IRGALITE® Rubine 4BP	Azo 4B-toner (Ca) Pigment Red 57:1		○	●	1.6	83		classical bluish red
IRGAZIN® Red 2027	Diketo-pyrrolo-pyrrole/Azo		○	●		1.6	27	blue shade red with good weather fastness and opacity
CHROMOPHTAL® Red A3B	Anthraquinone 65300	Pigment Red 177	●	●	○	1.4	113	red pigment with high color strength and good weather resistance
IRGAZIN® DPP Rubine TR	Diketo-pyrrolo-pyrrole		●	●		1.4	100	transparent DPP red pigment with outstanding color strength, excellent durability and saturation
CINQUASIA® Magenta B RT-343-D	Quinacridone 73907	Pigment Red 202	●	●	●	1.6	72	saturated transparent blue shade magenta
CHROMOPHTAL® Pink PT	Quinacridone 73913	Pigment Red 122	●	●	●	1.3	63	saturated blue shade magenta
CINQUASIA® Violet R NRT-887-D	Quinacridone 73900	Pigment Violet 19	●	●	●	1.5	64	high-performance pigment with excellent heat stability and durability
CINQUASIA® Violet R NRT-891-D	Quinacridone 73900	Pigment Violet 19	●	●	●	1.3	33	high-performance pigment with excellent heat stability and durability
CINQUASIA® Violet R NRT-795-D	Quinacridone 73900	Pigment Violet 19	●	●	●	1.5	35	bluish red with excellent durability
CROMOPHTAL® Violet B	Dioxazine 51345	Pigment Violet 37	●	●		1.4	61	high-performance pigment with excellent color strength used mainly as shading component
IRGALITE® Blue BSNF	Cu-Phthalocyanine (α non-flocc)	Pigment Blue 15:2	●	●	●			very clean red shade alpha phthalocyanine blue with high color strength
IRGALITE® Blue GBP	Cu-Phthalocyanine (β)	Pigment Blue 15:3	●	●	●	1.6	53	highly heat stable beta phthalocyanine blue offering good allround properties
IRGALITE® Green GLNP	Cu-Phthalocyanine (halogenated)	Pigment Green 7	●	●	●	2.1	43	

Chrome Yellow and Molybdate Orange Powder Pigments

Ciba® HORNACHROME® Yellow and Ciba® HORNA® Chrome Yellow pigments are widely used in many application fields. HORNACHROME®-A products are distinguished by extremely high color strength and opacity. The standard hues can vary from greenish to reddish yellow (lowest number indicates to most greenish hue, highest number most reddish hue). The HORNA® Chrome Yellow GU range consists of stabilized, brilliant shade yellows. HORNA® Chrome Yellow GM products are highly stabilized. HORNA® Chrome Yellow GMX products are highly stabilized and SO₂-resistant.

The standard hue of Ciba® HORNA® Molybdate Orange product ranges from yellowish to bluish orange (lowest number indicates yellowest hue, highest number bluest hue). The HORNA® Molybdate Orange ML range offers higher light fastness and SO₂-resistance.

Product name	Chemical type CI No	CI Generic name	Applications			Density (g/cm ³)	9% Soluble lead	Heat stability (°C)/ Overprint resistance	Acid-fastness/ Alkali-fastness	Solvent fastness/SO ₂ resistance	Weather fastness		Opacity	Color strength (1/25 ISD) (pigment/0.9 TiO ₂)
			Architectural	General industry	Appliance						Full shade	1:10 TiO ₂		
HORNA® Chrome Yellow CUA-19 77603	Lead (sulfo) chromate Pigment Yellow 34	● ●	5.2	-	200 5	4 1	5 2	4	4	high	1:20			
HORNA® Chrome Yellow CUAH-26 77603	Lead (sulfo) chromate Pigment Yellow 34	● ●	5.0	<2%	200 5	4 4	5 5	4	4	high	1:25			
HORNA® Chrome Yellow GUAH-35 77600	Lead chromate Pigment Yellow 34	● ●	5.0	<2%	200 5	4 4	5 5	4	4	high	1:34			
HORNA® Chrome Yellow GMH-35 77600	Lead chromate Pigment Yellow 34	● ●	5.5	<3%	200 5	3 4	5 3	4	4	high				
HORNA® Chrome Yellow GMXH-35-SQ 77600	Lead chromate Pigment Yellow 34	● ●	5.0	<2%	200 5	4 4	5 5	4	4	high				
HORNACHROME® Yellow GMXAH-25 77603	Lead (sulfo) chromate Pigment Yellow 34	● ●	5.0	<3%	200 5	3-4 4-5	5 5	4	4	high				
HORNACHROME® Yellow GMXAH-35 77600	Lead chromate Pigment Yellow 34	● ●	5.1	<2%	200 5	2 4	5 5	4	4	high				
HORNA® Molybdate Orange AAH-3-SQ 77605	Mix crystal lead-(sulfo)-chromate-molybda Pigment Red 104	● ●	6.2	<2%	200 5	1 3-4	5 4-5	4-5	4-5	high	1:13			
HORNA® Molybdate Orange MLH-74-SQ 77605	Mix crystal lead-(sulfo)-chromate-molybda Pigment Red 104	● ●	6.2	<2%	200 5	1 4-5	5 4-5	4-5	4-5	high	1:13			
HORNA® Molybdate Orange MLH-79-SQ 77605	Mix crystal lead-(sulfo)-chromate-molybda Pigment Red 104	● ●	6.2	<2%	200 5	1 3-4	5 4-5	4-5	4-5	high	1:13			

Pigment Preparations

Ciba® MICROLEN®-UA

The MICROLEN®-UA pigment concentrate range consists of well proven pigments in a finely dispersed, free flowing and dust-free form, especially suitable for the pigmentation of powder coatings. Pigment content is about 50% in a special Urea Aldehyde carrier.

Product name	Chemical type CI No	CI Generic name	Applications			Heat stability (°C)	Fastness PES/TGIC		Opacity (med = medium) Pigment/gant (1/25 SD)	Color strength (1/25 SD) Pigment/gant (1/25 SD)
			Architectural	General industry	Appliance		Full shade	1/25 ISD		
MICROLEN® Red 2030-UA	Diketo-pyrrolo-pyrrole 56110	Pigment Red 254	●	●	●	220	4-5	4	med	1:51
MICROLEN® Blue 4GNP-UA	Cu-Phthalocyanine (II) 74160	Pigment Blue 15:3	●	●	●	220	4-5	4-5	med	1:90
MICROLEN® Green GPN-UA	Cu-Phthalocyanine (halogenated) 74260	Pigment Green 7	●	●	●	220	4-5	4-5	med	1:38
MICROLEN® Black B-UA			●	●	●	220	4-5	5	high	1:78

Light Stabilizers

The Ciba® TINUWIN® and the Ciba® CHIMASSORB® ranges consist of light stabilizers with different chemistries. The range contains two types of light stabilizer: Ultraviolet Light Absorbers (UV-A) and Hindered Amine Light Stabilizers (HALS). UV-A filter harmful UV light and prevent mainly discoloration and delamination of coatings. HALS trap free radicals once they are formed and are mainly effective to retain surface properties such as gloss and prevent cracking and chalking of paints. HALS and UV-A show when used in combination a synergistic effect. Some of the HALS presented below in addition to their light stabilizers properties enhance triboelectric charging activity of powder coatings. Our extended product range enable to offer solutions for nearly all types of coatings technologies, including conventional and UV-curable powder.

Product name	Chemical type	Applications			Physical form	Volatile/thermalt stability (active substance)	Molecular weight (g/mol)	Basicity pK_b	Melt point (°C)	Density at 20 °C (g/cm³)	Main effect
		Architectural	General industry	Appliance							
Ultraviolet Light Absorbers (UV-Absorbers)											
TINUWIN® 900	Benzotriazole	●	○		solid	non-volatile	438	-	141	1.22	Light stabilizer
TINUWIN® 928	Benzotriazole	●	○		solid	non-volatile	442	-	113	1.14	Light stabilizer
TINUWIN® 405	Triazine	●	○		solid	non-volatile	584	-	74-77	-	Light stabilizer
Hindered Amine Light Stabilizers (HALS)											
TINUWIN® 144	Hindered amine	●	●	●	solid	non-volatile	683	5.5	146-150	-	Light stabilizer Tribo
CHIMASSORB® 119 FL	Hindered amine		○	●	solid	non-volatile	2286	-	115-150	1.03	Tribo
TINUWIN® 770 DF	Hindered amine	●	○		solid	non-volatile	481	5.0	81-85	1.03	Light stabilizer
HALS® Blends											
TINUWIN® 111 FDL	Hindered amine	○	●	●	solid	non-volatile	-	-	113-150	-	Light stabilizer Tribo

For Absorbance Spectra of selected Ultraviolet Light Absorbers (UV-Absorbers), see Appendix.

Antioxidants

Ciba® IRGANOX® and Ciba® IRGAFOS® antioxidants hinder thermally induced oxidation of polymers in coatings. They trap free radicals formed upon heating in presence of oxygen and prevent discoloration or change of resins mechanical properties.

Product name	Chemical type	Applications			Physical form	Molecular weight (g/mol)	Volatile	Melt point (°C)	Density at 20 °C (g/cm ³)
		Architectural	General industry	Appliance					
IRGANOX® 1010	Phenolic	○	○	●	solid	1178	non-volatile	110-125	1.15
IRGANOX® 1076	Phenolic	○	○	●	solid	531	non-volatile	50-55	1.02
IRGANOX® 245	Phenolic	○	○	●	solid	587	non-volatile	76-79	1.14
IRGAFOS® 168	Phosphite	○	●	●	solid	647	non-volatile	183-186	1.02
IRGAFOS® 126	Phosphite	○	●	●	solid	604	non-volatile	>160	1.15
IRGANOX® 8225	Phenolic/Phosphite	○	○	●	solid	-	non-volatile	-	-
IRGAFOS® XP 60	Lactone/Phosphite	●	●	●	solid	-	non-volatile	100-175	-
IRGANOX® XP 620	Lactone/Phosphite/Phenolic	○	●	●	solid	-	non-volatile	-	-

Optical Brighteners

Ciba® UVITEX® optical brightener is designed to brighten coatings and to mask yellowing. Optical brightening agent can also be used with the purpose to provide means of registration and coatings identification. Limited light fastness imply use for indoor applications.

Product name	Chemical type	Applications			Physical form	Molecular weight (g/mol)	Volatile	Melt point (°C)	Density at 20 °C (g/cm³)
		Architectural	General industry	Appliance					
UVITEX® OB	Benzoxazole	○	●	solid	430.6	non-volatile	197-202	1.26	

Photoinitiators

Ciba® IRGACURE®

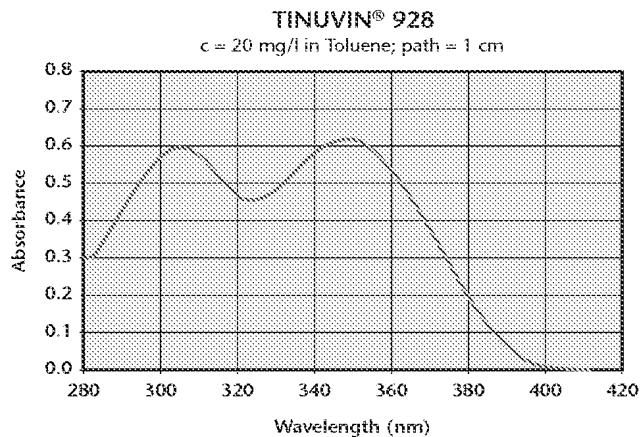
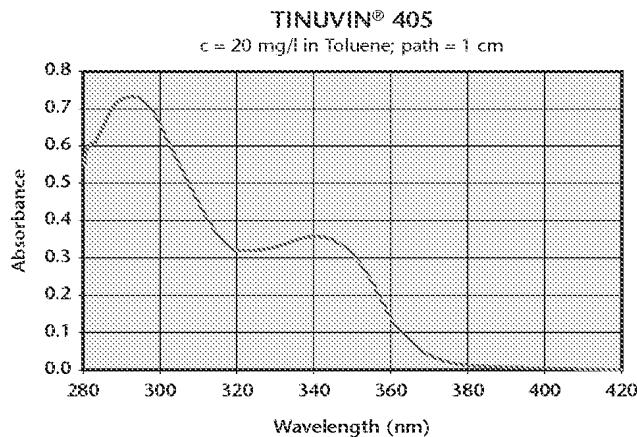
The IRGACURE® range is part of Ciba Specialty Chemicals' photoinitiators offer for Ultra Violet cured coatings. The table below presents a selection of the photoinitiators which are suited to the specific requirements of UV-curable powders. IRGACURE® 2959 is mainly used for clear coats while in the case of pigmented coatings a combination of IRGACURE® 2959 and IRGACURE® 819 is needed.

Product name	Chemical type	Applications		Physical form	Molecular weight (g/mol)	Volatile	Melt point (°C)	Density at 20 °C (g/cm³)	UV/VIS Absorption peaks (nm) in methanol
		General industry	Furniture						
IRGACURE® 2959	α-Hydroxyketone	●	●	solid	224	non-volatile	85-90	1.3	276,331
IRGACURE® 819	Bis Acyl Phosphine	●	●	solid	418	non-volatile	127-133	1.2	370,405

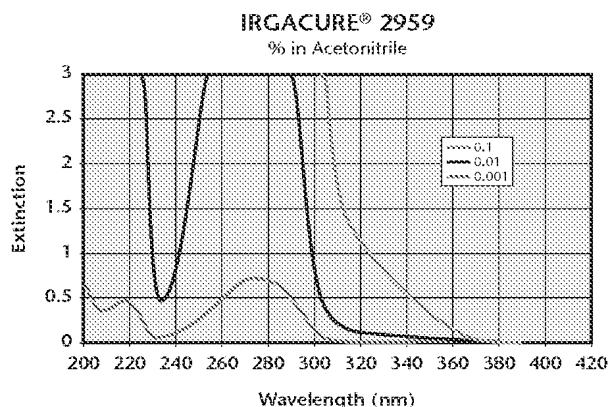
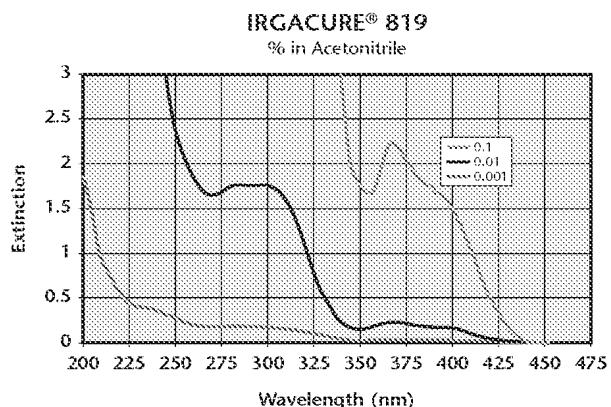
For Absorbance Spectra of selected Photo-initiators, see Appendix.

Appendix

Absorption Spectra of Ultraviolet Light Absorbers (UV-Absorbers)



Absorption Spectra of Photoinitiators



Test Methods – Fastness Properties of Pigments

The test methods used to assess chemical and physical fastness properties of Ciba Specialty Chemicals coatings pigment products are described below.

Pigments – Organic and Inorganic Powder Pigments

» Color Index

Names and numbers refer to entries in the Colour Index International, Society of Dyers and Colorists, Bradford, England, 2000.

» Density

Measured in accordance to ISO 787/X and quoted in g/cm³ at 20°C.

» Surface Area (Specific Surface)

Determined by the "BET" nitrogen adsorption method and is expressed in m²/g. (Ref. Brunauer, Emmet, Teller, "Journal Amer. Chem. Soc." 57, 1954.)

» Heat Stability

Powder coated panels of PES/TGIC are cured at different temperatures from 20 min. at 160°C up to 20 min. at 220°C. The panels are assessed versus the 20 min. at 160°C panel. The classical pigments are tested in an epoxy polyester resin, in this case the temperatures range is between 20 min. at 140°C and 20 min. at 200°C. The given value is the temperature at which only a very slight discoloration occurs.

» Overpaint Resistance/Bleeding

Determination carried out on full strength PES/TGIC stoved finish coated with white alkyd melamine paint and restoved for 30 minutes at 130°C. Discoloration against white background assessed using the ISO Gray Scale 105 A02 (1–5) for color change (scale: 1 = severe change, 5 = no change).

» Chemical Fastness

Resistance was tested on a PES/TGIC film against the ISO Gray Scale 105 A02 (1–5) for color change (0.5 N HCl, 2.5% NaOH) (scale: 1 = severe change, 5 = no change).

» Fastness to Weathering ISO11341

Resistance to weathering is determined on panels coated with PES/TGIC powder coating. Exposure was carried out in ATLAS Weather-O-Meter according to ISO11341 (Method 1, Cycle A). The panels were exposed for 2000 hrs. The assessment was made by using the Gray Scale ISO 105 A02 (1 = lowest rating, 5 = highest).

» Opacity

The opacity/hiding power was assessed in full shade based on the contrast (ΔE -value) over a black/white panel (Description: low = low opacity, transparent; med = medium opacity; high = high opacity).

» Color Strength ISO 784/24

The data for the color strength indicate how many parts titanium dioxide to one part color pigment or one part color pigment preparation. The higher the white pigment content needed, the higher the color strength. The data were determined in a Polyester/TGIC powder coating system, the dispersion was carried out on a double screw extruder. These figures should be taken only as a guide. Absolute ISD data is influenced very much by the specific polymer system used and by individual processing conditions.

Pigments – Chrome Yellow and Molybdate Orange Powder Pigments

» **Color Index – Density – Oil Absorption – Heat Stability – Overpaint Resistance/Bleeding – Color Strength – Opacity**
see above: Pigments – Organic and Inorganic Powder Pigments.

» **Soluble Lead**
Measured in accordance to ISO 6713-2 and quoted as percentage of soluble lead.

» **Chemical Fastness**
0.5 % of dry pigment was mixed with 15 ml 5% HCl or 1% NaOH solution. After 1 hour, the color differences were assessed against the ISO Gray Scale 105 A02 (1–5) (scale: 1 = severe change, 5 = no change).

» **Solvent Fastness**
0.2 g of pigment was suspended in 10 ml of solvent in a folded filter. After 24 hrs the filter containing the pigment was removed and the staining of the solvent was assessed using the ISO Gray Scale 105 A02 (1–5) (scale: 1 = severe change, 5 = no change).

» **SO₂ Resistance**
PES/TGIC coated full strength panels were exposed according to DIN 50018 (3 cycles, 2 liters SO₂). Assessment versus ISO Gray Scale 105 A02 (1–5) (scale: 1 = severe change, 5 = no change).

» **Weathering / Durability**
Panels at full shade and at 1:10 white reduction (TiO₂) based on a PES/TGIC resin system were exposed for 1000 hours in an Atlas Weather-O-Meter (Xenon burner, DIN 53–387). Assessment was made using the ISO Gray Scale 105 A02 (1–5) for color change (scale: 1 = severe change, 5 = no change).

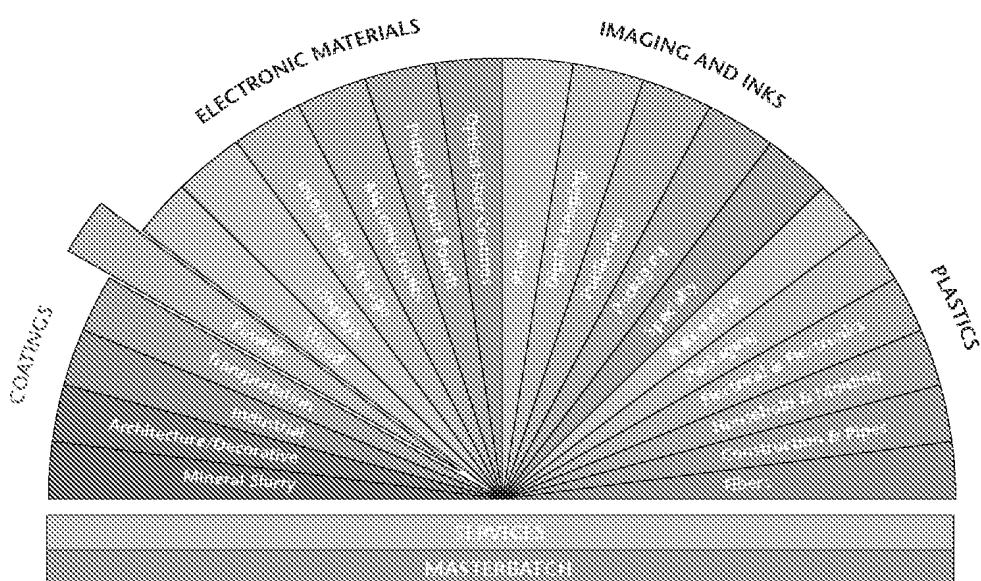
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